"LINES OF DEMARCATION"

BETWEEN

MAN, GORILLA, & MACAQUE.

BY

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"In the investigation of the anatomy of the limbs we perceive abundant and most instructive illustrations of the operation of two great laws, viz.: the law of UNITY OF PLAN, which may be called the LAW OF TYPE, and the law of ADAPTATION TO PARTICULAR REQUIREMENTS. We have found that, throughout the vertebrate series, the limbs present a marked similarity in their general construction; yet that they are subject to varieties of form as numerous as the various modes in which their functions have to be performed. And this grafting of an endless variety of detail upon one plan, in conformity with the endless variety of wants and feelings and offices of the several animals—this combination of variety with uniformity, in which the deviations of each form from the others are no more than are absolutely necessary to attain the required end—constitutes one of the most striking features in creation, and arrests the attention of thoughtful observers in every part of the domain of nature. Many theories have been connected with it, none of which are perhaps entirely satisfactory. We cannot doubt that the working out of variety in detail in the several parts of an animal's frame, so as to bring each part into harmony with the others and with the sensational and volitional qualities of the creature, is effected under the influence of some high controlling law; that the modifications of the limbs, for instance, in accordance with the peculiarities of the brain and the attendant wants and desires of the animal, take place in obedience to some definite principle; and that the development of any one organ bears some close relation to the development of the others; but the nature of that relation, and the manner in which the influences of the formative processes in different parts are mutually operative, are subjects which lie too deep in the mysteries of nutrition for us even to venture, at present, to speculate upon."—*Humphry.*

PREFACE.

In these few pages I have endeavoured to bring together for comparison in a tabular form some of the most important points in the anatomy of Man, the Gorilla, and Macaque.

For materials beyond my own dissections I have consulted the following works :—

On the Osteology of the Chimpanzee *and* Orang Utan. *By Richard* Owen, *F.R.S. Transactions of the Zoological Society of London*, vol. i.

Osteological Contributions to the Natural History of the Orang Utans. *By Richard* Owen, *F.R.S. Transactions of the Zoological Society*, vol. ii.

Osteological Contributions to the Natural History of the Chimpanzees, including a Description of the Skull of a Large Species (Troglodytes Gorilla, *Savage*) *discovered by* Thomas S. Savage, *M.D. in the Gaboon Country, West Africa. By Professor* Owen, *F.R.S., F.Z.S., &c. Transactions of the Zoological Society*, vol. iii.

Description of the Cranium of an Adult Male Gorilla, from the River Danger, West Coast of Africa, indicative of a Variety of the Great Chimpanzee (Troglodytes Gorilla), *with Remarks on the Capacity of the Cranium and other Characters shown by Sections of the Skull, in the Orangs* (Pithecus), *Chimpanzees* (Troglodytes), *and in different Varieties of the Human Race. By Professor* Owen, *F.R.S., F.Z.S., &c. Transactions of the Zoological Society*, vol. iv.

Comparison of the Lower Jaw and Vertebral Column of the Troglodytes Gorilla, Troglodytes Niger, Pithecus Satyrus, *and different Varieties of the Human Race. By Professor* Owen, *F.R.S., F.Z.S., &c. Transactions of the Zoological Society*, vol. iv.

Characters of the Skull of the Male Pithecus Morio, *with Remarks on the Varieties of the Male* Pithecus Satyrus. *By Professor* Owen, *F.R.S., F.Z.S., &c. Transactions of the Zoological Society*, vol. iv.

Comparison of the Bones of the Limbs of the Troglodytes Gorilla, Troglodytes Niger, *and of different Varieties of the Human Race; and on the General Characters of the Skeleton of the Gorilla. By Professor* Owen, *F.R.S., F.Z.S., &c. Transactions of the Zoological Society*, vol. v.

Odontography, or the Comparative Anatomy of the Teeth. By Richard Owen, *F.R.S.*

Trois Mémoires sur les Caractères Anatomiques des Grands Singes Pseudo-Anthropomorphes. Par M. Duvernoy. *Archives du Muséum d'Histoire Naturelle*, tome viii.

Quatrième Mémoire. Famille des Singes. Par M. Isidore Geoffroy Saint-Hilaire. *Archives du Muséum d'Histoire Naturelle*, tome x.

Evidence as to Man's Place in Nature. By Thomas Henry Huxley, *F.R.S.*

Observations on the Limbs of Vertebrate Animals. *By G. M.* Humphry, *M.D., F.R.S., Cambridge.*

CRANIUM.

	IN MAN.	IN GORILLA.	IN MACAQUE.
TEMPORAL RIDGES.	The frontal swells out into a broad convexity between these ridges, and further back the whole upper surface of the cranial dome intervenes between them.—*Owen.*	Arch upwards and backwards, and blending to form the parietal crest, define the upper contour of the cranium. The frontal sinks below the converging ridges, forming a concavity in their interspace. *Owen.*	As in the Gorilla.—*Author.*
LAMBDOIDAL RIDGE.	Curves with the convexity upwards, below the suture, to terminate in the occipital spine, a free tract of bone more than an inch in breadth, dividing the lambdoidal from the temporal ridges, and being continued between them upon the mastoid process.—*Owen.*	Curves with the concavity upwards as it extends from the mastoid, where it is blended with the back part of the temporal ridge; obliterates the suture, and joins the hind end of the sagittal crest. The lambdoidal crest terminates the contour of the cranium behind, as the sagittal does above.—*Owen.*	As in Gorilla, with this slight difference, viz., the lambdoidal crest in starting from the mastoid is at first convex upwards, but soon becomes concave in the same direction.—*Author.*
TYMPANIC OR AUDITORY PROCESS.	The long and larger mastoid process, projecting downwards, and extending forwards beneath the meatus auditorius externus, supports the vaginal plate of the tympanic or auditory process.—*Owen.*	Presents the form of a semicylindrical tube, is wholly in advance of the shorter mastoid process, and has no vaginal process at its outer end. *Owen.*	As in the Gorilla.—*Author.*
POST-GLENOID PROCESS OF THE SQUAMOSAL.	Is the middle root of the zygoma. *Owen.*	Is relatively thicker, longer, but more obtuse than in Man.—*Owen.*	As in the Gorilla.—*Author.*
ZYGOMA.	The squamosal part is shallower and longer than the malar. The malar portion decreases in depth after leaving the body of the bone. *Owen.*	The squamosal is as deep and as long as the malar part, and the latter does not decrease in depth after leaving the body of the bone. *Owen.*	As in the Gorilla.—*Author.*
SUPRAORBITAL RIDGE.	Projects very slightly beyond the slope of the frontal, between the external angle and the prominent sinus. The development of the prosencephalon carries the interorbital part of the frontal forward, so as to bring the orbital cavity into view in advance of its lateral malar boundary.—*Owen.*	Projects considerably beyond the slope of the frontal. Viewed from the side, no part of the orbit is seen in advance of its lateral malar boundary.—*Owen.*	The supraorbital ridge as in the Gorilla. Viewed from the side, a small portion of the lachrymal bone is seen in advance of the malar boundary of the orbit.—*Author.*
OUTLINE OF FACE.	The prominent nasal bone forms part of the anterior outline below the overarching frontal in man; the concave maxillary border of the external nostril leads from the nasal to the short and slightly projecting anchylosed premaxillary bone supporting the almost vertical crowns of the incisors.—*Owen.*	Notwithstanding the characteristic projection of the nasal, the thick swollen external wall of the orbit shuts it out of view. Below the malar the alveolars of the great canine in the maxillary, and then the prominent premaxillary and incisors complete the anterior contour.—*Owen.*	Excepting the external wall of the orbit shutting the nasals out of view, as in the Gorilla.—*Author.*
UPPER JAW.	In a direct side view, a part only of the crown of the outer incisor, and scarcely any of the inner incisor, can be seen projecting beyond the canine.—*Owen.*	The whole crown of the outer incisor, and the more prominent part of inner incisor, extend beyond the canine.—*Owen.*	As in the Gorilla.—*Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
UPPER JAW.	Is subquadrate.—*Owen.* There is a marked difference between this bone in the European and Australian ; in the latter the anterior border slopes to the alveolar, whilst the posterior border and pterygoids are more oblique, giving the " prognathous " character to the face.—*Author.*	Although the alveolar border forms a right angle with the posterior border, the long anterior border slopes forwards towards the lower border at an acute angle, and to the same degree departs from its parallelism with the posterior border. The whole alveolar border of the upper jaw extends much further below the base of the cranium than in Man.—*Owen.*	The slopes of the borders of the bone as in the Gorilla ; the alveolar border extends no further below the base of the skull than in Man ; a line drawn horizontally from the lowest part of the base of the cranium forwards in each case touches the inferior border of the malar process of the superior maxillary bone.—*Author.*
ECTOPTERYGOID.	Is a little broader than the entopterygoid, the antero-posterior extent of the base being half an inch.—*Author.*	Is shorter, but the antero-posterior extent of the base of this process is relatively much greater than in Man.—*Owen.*	Is four times as broad as the entopterygoid ; the antero-posterior extent of the base being one inch. *Author.*
FRONT VIEW OF HEAD AND FACE, IN WHICH THE NASAL CAVITY IS THE CENTRE OF THE PERSPECTIVE PLANE.	The upper half is formed by the frontal part of the cranial dome, the expanded sides of that dome are visible behind and beyond the outer walls of the orbits, and the mastoid processes come into view behind the angles between the molars and maxillaries. Of the regular arch formed by the equable teeth, only the hinder molars are excluded from view.—*Owen.*	Such is the enormous development of the facial part of the skull as compared with the cranial part, that little more of the cranium is visible than that which forms the base of the sagittal crest. The thick supraorbital ridge and outstanding malars and maxillaries compose the major part of the plane, and the prognathic pre-maxillaries and incisors with the great canines and their tumid alveoli complete with the broad and deep lower jaw the view below.—*Owen.*	As in the Gorilla.—*Author.*
LACHRYMAL BONE.	The posterior border articulates with the os planum, not unfrequently however it is encroached upon by the orbital plate of the superior maxillary.—*Author.*	Is either separated from the os planum, or is united to it in a much smaller proportion than in Man ; and the orbital part of the lachrymal is much smaller as compared with the part excavated for the lachrymal fossa than it is in Man.—*Owen.*	As in the Gorilla.—*Author.*
MALAR BONE.	The ectorbital plate forms a third, sometimes half, of the outer wall of the orbit.—*Author.*	The ectorbital plate is longer, and extends deeper into the orbit, than in man.—*Owen.*	As in the Gorilla.—*Author.*
CRANIUM VIEWED FROM ABOVE, IN WHICH THE BEGINNING OF THE SAGITTAL SUTURE IS THE CENTRE OF THE PERSPECTIVE PLANE.	Scarcely anything is seen but the smooth expanded vault of the cranium ; the narrower temples of the Negro and Australian allow the zygomata to come into view, and in the most prognathic examples, the incisors just appear between the prominences of the frontal sinuses.—*Owen.*	The whole length of the face from the lower border of the orbits is seen sloping from beneath the supraorbital ridge; the whole span of the zygomatic arches, with parts of the temporal fossæ, appear at the sides of the narrower temples ; the oval cranial vault, after a certain expanse, changes its curve, and from being convex becomes concave, expanding into a broad base, formed by the supraorbital ridge in front, and by the lambdoidal crest behind, continued into the zygomatic arches at the sides. The small cranial dome also supports the strong sagittal crest which at the coronal suture divides and diverges, curving outwards to the external angles of the supraorbital ridge.—*Owen.*	As in the Gorilla, with these slight modifications, viz., the upper part of the cranium is nowhere so concave as it appears to be in the Gorilla and the strong sagittal crest does not divide until within half an inch of the supraorbital ridge. *Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
BASIOCCIPITAL.	Becomes inseparably united with the basisphenoid, so as to form one bone. I was, however, last winter, enabled to show my class these bones in an adult still quite separate.—*Author.*	Is longer, thicker vertically, flatter below, and broader in front than in Man ; it sends out short precondyloid processes into the jugular foramina on each side ; these are overlapped by the synonymous processes of the petrosal anterior to the precondyloid holes ; the basioccipital does not anchylose with the basisphenoid ; the posterior border of the basioccipital becomes less expanded where it joins the condyles.—*Owen.*	As in the Gorilla.—*Author.*
BASIOCCIPITAL AND BASISPHENOID.	Curve from below upwards and forwards.—*Owen.*	Both extend straight forwards, parallel to the plane of the palate. *Owen.*	In a young Macaque as in the Gorilla ; but in the adult, from which the present comparisons are drawn, the basisphenoid sloped upwards and forwards from the basioccipital.—*Author.*
OCCIPITAL CONDYLES.	The postcondyloid foramina are occasionally absent. The lambdoidal suture is permanent.—*Author.*	Are much smaller compared with the size of the skull than in Man ; they are also less convex and more rounded at their extremities ; they are wider apart, and their axes diverge at a more open angle from before backwards. There are no postcondyloid holes. The suture between the exoccipital and mastoid remains, but the rest of the lambdoidal suture is obliterated. *Owen.*	The anterior extremities of the condyles are more pointed, and the posterior more rounded ; in other respects they agree with those of the Gorilla. In one specimen the postcondyloid foramina existed, but not in the other. The lambdoidal suture is equally obliterated by the growth of the great crest.—*Author.*
SUPRAOCCIPITAL.	Is convex externally ; the superior angle forming the apex of lambdoidal suture.—*Author.*	Is a much broader plate than in Man, and is flat or slightly concave externally, with all trace of the superior angle lost in the anchylosis consequent on the development of the great longitudinal ridge ; it shows nothing answering to the cranial ridge or spine of the human convex occiput, except in some skulls, the vertical ridge dividing the great subconcave expanse.—*Owen.*	As in the Gorilla.—*Author.*
BASISPHENOID.	The sinuses are confined to the basisphenoid and presphenoid.—*Owen.*	The basisphenoid has a large extent uncovered by the vomer and by the bases of the anchylosed alisphenoids and pterygoids ; it is excavated by large sinuses extending into both the alisphenoids and pterygoids. *Owen.*	Is equally uncovered by the vomer, and anchylosed alisphenoids and pterygoids, but the sinuses are confined to the presphenoid. *Author.*
MIDDLE FOSSA OF THE CRANIUM AND PTERYGOIDS.	The ectopterygoid is continuous with, but does not embrace any part of the base of the alisphenoid. *Author.*	The broader pterygoids anchylose with and, as it were, embrace a greater part of the base of the alisphenoid ; the foramen ovale is more remote from the foramen caroticum, and is pushed by the broad ectopterygoid further back from the pterygo-maxillary fissure ; the extent of the basis cranii between the carotid foramen and the spheno-maxillary fissure being twice that in Man.—*Owen.*	The ectopterygoid is relatively as broad as in the Gorilla ; the pterygoid fossa is much larger relatively than in Man. The middle fossa of the cranium as in the Gorilla. *Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
ZYGOMATIC AND TEMPORAL FOSSA.	In the Australian the alisphenoid ascends higher than the malar, but not so far as in the European. *Owen.* In one Australian skull the alisphenoid joined the parietal just above the level of the suture between the external angular process of the frontal and the malar bone; in another, the alisphenoid extended $\frac{3}{8}$ of an inch above the same spot.—*Author.* Taking the average of five European skulls, the alisphenoid reached to a level of $\frac{3}{4}$ of an inch above the highest point of the temporo-frontal articulation.—*Author.*	Outside the pterygoids the alisphenoid becomes narrower, and is continued more directly upwards than in Man: the ectopterygoid ridge is less developed, and the fossa on the outer side of the ectopterygoid is not present, or is very feebly developed. The alisphenoid contracts instead of expanding as it rises, terminates before it gains half the height of the orbit, and is excluded from junction with the parietal by the meeting of the squamosal with the frontal. Besides the relatively smaller size of the parietal bones, the early obliteration of the sagittal suture, and the development of the crista upon it, the lower border of the parietal is straighter than in Man, and more equally divided between the squamosal and the mastoid.—*Owen.*	In two specimens the alisphenoid ascended further than in the Gorilla. In the adult it was excluded from the parietal by the meeting of the squamosal with the frontal. In the younger on the left side the frontal, parietal, squamosal, and alisphenoid met at a point on a level with or slightly above the junction of the malar with the external angular process of the frontal. On the right side the alisphenoid did not rise quite to the same level, nevertheless the parietal dipped low enough to articulate with it, and to separate, as much as in most human skulls, the squamosal from the frontal. *Author.*
SELLA TURCICA.	The convex chiasmal part of the presphenoid, which is in front of the anterior clinoid processes, has less than a third of the extent of the concave pituitary portion. *Author*	The presphenoid where it forms the seat of the optic chiasma is not defined as in Man by the abrupt excavation of the sella behind it; but the sphenoidal cells raise the floor of the sella to a level with the chiasmal platform into a convexity which gradually sinks as it recedes into the hollow of the sella, which is shallower than in Man, and the longitudinal diameter is greater than the transverse one. If the sella or space between the anterior and posterior clinoid processes be divided into a convex chiasmal and concave pituitary part, they are more equal than in Man.—*Owen.*	The floor of the sella is not raised, the cells only existing, as before mentioned, in the presphenoid. The sella turcica is consequently as well marked as in Man.—*Author.*
ORBITOSPHENOID.	Does not join the alisphenoid, the fissure between the two being converted into a foramen by the articulation of the frontal.—*Owen.*	Coalesces nearer its origin with the orbital plate of the alisphenoid, obliterating the fissure which in Man is continued outwards from the "foramen lacerum anterius;" so that this foramen is better defined and has a subquadrate form; and there are no ridges called "alæ minores" defining the fossa of the anterior lobe from that of the middle lobe of the brain as in Man. A short triangular plate divides the optic hole from the foramen lacerum anterius on each side, which plates answer to the rudiments of the "alæ minores" and to the bases of the anterior clinoid processes, but these processes are not extended backwards as in Man.—*Owen.*	As in the Gorilla.—*Author.*
FORAMEN ROTUNDUM.	Is $\frac{1}{8}$ of an inch below the posterior margin of the foramen lacerum anterius.—*Author.*	Is closer to the foramen lacerum anterius than in Man.—*Owen.*	Is further from the foramen lacerum anterius than in Man, and a deep groove commencing at the posterior border of the alisphenoid leads directly to it.—*Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
GLENOID FOSSA.	Is bounded behind by the auditory process, and is traversed by the "fissura Glasseri."—*Owen.*	The auditory process forms no part of the glenoid fossa, but is separated from it by the post glenoid process. The rudiment of the fissura Glasseri is quite behind the glenoid fossa.—*Owen.*	As in the Gorilla.—*Author.*
MASTOID CELLS.	Are separated from the squamosal by the tympanum.—*Author.*	Extend into the squamosal, inflating it above the base of the zygomatic process, and as far forwards as its junction with the frontal, where the squamosal sinuses are contiguous to, though they seem not to communicate with, those of the alisphenoid.—*Owen.*	Although the squamosal is bulged, these air cells do not extend into it.—*Author.*
PETROSAL.	A strong plate of bone extends from the outer part of the foramen caroticum to stylo-mastoid foramen enclosing posteriorly the base of the styloid process.—*Author.*	Is larger than in Man ; its antero-posterior diameter especially is greater ; its Eustachian process is much more developed and more distinct from the proper apex of the petrosal, which is less jagged than in Man, and rests more completely upon the base of the alisphenoid, almost filling up the vacuity called the "foramen lacerum medium" in Man. The carotid foramen is smaller than in man ; it is defended by an irregular ridge externally, which divides it from the stylo-hyal fossa, and is the sole representative of the vaginal process.—*Owen.*	As in the Gorilla.—*Author.*
	The intercranial is the longest and largest division of the bone. *Author.*	The intercranial part of the petrosal is relatively shorter than in Man : its upper surface is more even : the channel of the lateral sinus which defines it behind is narrower. The foramen auditorium internum has not the overhanging ridge ; the superior border is not grooved by the petrosal sinus. *Owen.*	The greater relative smoothness of the upper surface and lesser relative size of the lateral sinus are questionable. In all other respects the intercranial part of this bone is as in the Gorilla.—*Author.*
ECTORBITAL PROCESSES OF THE FRONTAL.	Articulate with the malars on a level with the superior external angle of the orbit.	Compared with those of Man they stand further out before they bend down to join the malar, and the postorbital angles descend much lower into the temporal fossa and form a longer wedge between the alisphenoid and malar bones, the point terminating on a level with the floor of the orbit.—*Owen.*	Do not project as far as in the Gorilla, nor do the postorbital angles descend to the level of the floor of the orbit. In the adult they did not reach lower than half the depth of the orbit ; in the younger specimen than two-thirds of the depth of the same cavity.—*Author.*
VOMER.	Extends as far forwards as to the anterior opening of the nares.	Is deeper and more oblique than in Man, and does not reach so far forwards.—*Owen.*	As in the Gorilla.—*Author.*
PREFRONTALS.	The "crista galli" usually rises to a level with the floor of the anterior fossa of the skull.	Do not extend backwards to form a "crista galli." The cribriform plate is much smaller, and is sunk into a deep (rhinencephalic) fossa. —*Owen.*	As in the Gorilla.—*Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
Palatines.	The posterior border of the bony palate presents two lateral concave emarginations, divided by a median point (or spine).—*Owen.*	Form a small portion of the bony palate ; their mesial anterior ends advance forwards in a point between the maxillaries, but the mesial posterior ends are truncate, and the border of the bony palate there presents either a shallow median emargination, between two slighter ones, or the whole posterior boundary (in the younger male) is slightly undulated with a general curve backwards. The posterior palatine foramina are close to the anterior palato-maxillary suture.—*Owen.*	Are more like those of Man than are the same bones in the Gorilla : thus, they form a larger portion of the bony palate ; their anterior borders do not meet in a point, but form a somewhat semicircular suture with the maxillaries ; their posterior borders are concave, and where they meet in the central line a pointed process curves upwards to join the vomer. The posterior palatine foramina are not close to the palato-maxillary suture, but nearer the tuberosities.—*Author.*
Superior Maxillary.	There are sometimes two, more frequently one infraorbital foramen. Forms a large part of the boundary of the nostril.—*Owen.*	Besides its greater relative size, has a relatively longer and shallower palatal portion without any median convexity ; it is more expanded anteriorly, instead of being contracted between the premolars ; its malar process is considerably deeper, and is perforated by the maxillary nerve at a greater distance below the orbit ; the single foramen for this nerve is the rarer variety than the double. It is excluded from the nostril by the elongation of the premaxillary and the interposition of the upper angle of that bone between the maxillary and the nasal. The double fangs of the premolars render the alveolar border or "process" more complex than it is in Man ; and it is tumid, and produced anteriorly by the sockets for the enormous canines.—*Owen.*	There are three infraorbital foramina, not much lower down relatively than in Man. All the other particulars of this remarkable bone as in the Gorilla.—*Author.*
Pre-Maxillaries.	Form a very small portion of the superior maxillaries.	Differ from those of Man by their vastly greater proportional size, their greater prominence, the longer persistence of their sutures with the maxillaries and their nasal processes. The extent of their palatal part removes the prepalatal foramina further back from the alveoli, and their foramina are double, or not so completely blended into a single hole below as in Man. Their median suture with each other, instead of being supported on a prominent ridge at the anterior surface of the bone, as in Man, is sunk into a smooth fossa, and the nasal ridges for the support of the septum narium commence quite within the nostril behind an arched transverse eminence or bar.—*Owen.*	There is only one prepalatal foramen, and the transverse bar does not seem to exist. In all other respects closely resemble the same bones in the Gorilla.—*Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
MALAR.	The malo-maxillary suture extends more outwards before it descends, the suborbital angle of the malar being longer, more slender, and pointed than in the Gorilla.—*Owen.*	Besides its superior relative size, has a more convex anterior surface, which is turned more forwards towards the front of the face than in Man: the line of the malo-maxillary suture descends more directly downwards and outwards. The posterior border of the ectorbital or frontal process is straight at its commencement, not convex as in Man: the entorbital plate of the malar extends further backwards and unites in a smaller proportion with the alisphenoid than with the frontal. The zygomatic suture is a regular or slightly wavy oblique line, not made regular or curved by a sudden notch in the upper part of the zygomatic process of the malar as in Man. The entorbital plate is imperforate. *Owen.*	Corresponds with that of the Gorilla with this one exception, that its entorbital plate is pierced as in Man.—*Author.*
LOWER JAW.	There is a chin. The distance between the condyles is greater than the distance from the back of the condyle to the symphysis. The sockets from the molars to the incisors progressively diminish in size. *Author.*	There is no chin. The distance between the condyles is not so great as the distance from the back of the condyle to the symphysis. The sockets from the molars to the incisors do not progressively diminish in size.—*Owen.*	As in the Gorilla.—*Author.*
HYOID BONE.	No trace of a cavity in the body. Lesser cornu distinct.—*Author.*	The body is relatively much larger than in Man; it is more deeply excavated behind with the aperture directed towards the glottis. There is no trace of lesser cornu. The great cornu is long and nearly straight.—*Owen.*	The body is relatively much larger than in Man, and is hollowed out into a large cavity which communicates posteriorly with the glottis by a small aperture below the epiglottis. There is no lesser cornu. The great cornu is straight and long.—*Author.*

CRANIAL MEASUREMENTS.

	IN MAN.	IN GORILLA.	IN MACAQUE.
THE BASICRANIAL AXIS.	Being 100.	Being 100.	Being 100.
THE CEREBRAL LENGTH.	Is 270.—*Author.*	Is 170.—*Huxley.*	Is 182.—*Author.*

DENTITION.

	IN MAN.	IN GORILLA.	IN MACAQUE.
CANINES.	There is no sexual superiority of size, either of the canines or any other single tooth.—*Owen.* Reason furnishes Man, in the lowest condition of savage life, with weapons more formidable than sharp and long canines.—*Owen.*	The canines are conical, pointed, with trenchant posterior margins, always larger than the adjoining teeth, and acquiring, in the males, the proportions of those teeth in the true carnivora. This formidable development of the canine teeth seems, at first glance, to relate to the preponderance of animal food in their regimen; but the sexual difference in the development of those teeth might have indicated that they had other subserviencies than to the acquisition of daily sustenance, if observation had not shown them to have been given to the males for the purpose of combat and defence.—*Owen.*	As in the Gorilla.—*Author.*
PREMOLARS OF UPPER JAW.	Have each a single fang, or rather two fangs connate.—*Owen.*	Have each three diverging fangs, two external and one internal.—*Owen.*	As in the Gorilla.—*Author.*
OF LOWER JAW.	Have each a single fang. The first premolar is smaller than the second. —*Owen.*	Have each two fangs, of which the anterior is the larger. The first premolar is larger than the second, and the anterior surface of its crown is worn by the upper canine in inclining it backwards. *Owen and Duvernoy.*	As in the Gorilla.—*Author.*
REMARKS TO BE TAKEN IN CONNEXION WITH WHAT HAS PREVIOUSLY BEEN SAID OF THE DEVELOPMENT AND GROWTH IN THE MALE OF THE GREAT SAGITTAL AND LAMDOIDAL CRESTS.	The sagittal and lamdoidal crests are absent, and no tooth surpasses another in the depth of its crown. *Owen.* No brutal characters are added to the head and face at puberty.—*Author.*	Those features of the cranium of the *Gorilla* which stamp the character of irrational brute most strongly upon his frame, are of a kind, and the result of a law originally impressed upon the species, which cannot be supposed to be modified under any circumstances, or during any lapse of time; for what external influence operating upon and around the animal can possibly modify in its offspring the forms, or alter the size, of the deeply seated germs of the permanent teeth? They exist before the animal is born, and let him improve his thinking faculties as he may, they must, in obedience to an irrisistable law, pass through the phases of their development, and induce those remarkable changes in the maxillary portion of the skull which give to the adult *Gorilla* almost bestial form and expression of head.—*Owen.*	As in the Gorilla.—*Author.*

VERTEBRÆ.

	IN MAN.	IN GORILLA.	IN MACAQUE.
CURVES.	The vertebræ in the three regions, cervical, dorsal, and lumbar, form a convexity, then a concavity, and lastly a convexity forwards.—*Owen.*	The vertebræ in the three regions, cervical, dorsal, and lumbar, form only one curve, which is open on the ventral side or forwards. *Owen.*	On stripping the muscles from the vetebral column, still retaining the ligaments, there was a marked convexity forwards in the upper ⅔ of the cervical region, then a long concavity forwards to the lumbar region, where a slight convexity forwards again showed itself. These curves were the result of elasticity of the ligamenta subflava, and must have existed during life. *Author.*
CERVICAL.	7 in number. Spinous processes short and bifid. *Author.*	7 in number. Spinous processes enormously long, not bifid.—*Owen.*	7 in number. Spinous processes short, not bifid.—*Author.*
AXIS.	Superior articulating processes nearly horizontal.—*Author.*	Superior articulating processes very oblique.—*Author.*	As in the Gorilla.—*Author.*
DORSAL.	12 in number.—*Owen.*	13 in number.—*Owen.*	12 in number.—*Author.*
LUMBAR.	5 in number.—*Owen.*	4 in number. When naturally articulated together, they form a straight line without any tendency to convexity forward as in Man.—*Owen.*	7 in number. Whereas the lumbar vertebræ of Man and Gorilla are much alike, they are very different from either in Macaque, possessing large pleurapophyes, well-developed metapophyses, and finally are anapophysially interlocked.—*Author.*
PELVIS.	Differs considerably from that of the Gorilla, to which, however, it has more resemblance than to that of any other Ape.	Characterised by its enormous size, and its nearer approach to the shape of the human pelvis.	Has little resemblance to the human pelvis.
TAIL.	None.	None.	Of variable length.

EXTREMITIES.

	IN MAN.	IN GORILLA.	IN MACAQUE.
LENGTH.	The pelvic extremity is longer than the thoracic.—*Owen.*	The thoracic is longer than the pelvic extremity.—*Owen.*	The pelvic is longer than the thoracic extremity.—*Author.*
SCAPULA.	Nothing further need be said of this bone than is included under the heads Gorilla and Macaque.	Approaches very much the shape of that of Man, the coracoid process is relatively larger.—*Owen.*	Differs very much in shape from either that of Man or Gorilla, but, as in the latter, the coracoid process is relatively larger than that of Man.—*Author.*
HUMERUS.	Is 5 inches shorter than the femur. *Author.*	Is more than $\frac{1}{4}$ of its own length longer than the femur.—*Owen.*	Is 1-12th of its own length shorter than the femur.—*Author.*
RADIUS.	Is shorter than the humerus by $4\frac{1}{2}$-14ths of its length.—*Author.*	Is shorter than the humerus by 3-14ths of its length.—*Owen.*	Is of the same length as the humerus.* *Author.*
HAND.	Is about a third the length of the arm and forearm added together. *Author.*	Is not quite a third of the length of the arm and forearm added together.—*Owen.*	Is about a third the length of the arm and forearm added together. *Author.*
Relative lengths of the Digits. The letters express the order of precedence as regards length.	1st, or thumb ... *e.* 2nd ... ... *c.* 3rd ... ... *a.* 4th ... ... *b.* 5th ... ... *d.* *Author.*	1st, or thumb ... *e.* 2nd ... ... *c.* 3rd ... ... *a.* 4th ... ... *b.* 5th ... ... *d.* *Author.*	1st, or thumb ... *e.* 2nd ... ... *c.* 3rd ... ... *a.* 4th ... ... *b.* 5th ... ... *d.* *Author.*
FEMUR.	Is longer than the humerus.—*Owen.*	Is shorter than the humerus.—*Owen.*	Is slightly longer than the humerus. *Author.*
	The great trochanter is much below the head of the bone.—*Author.*	The great trochanter rises higher than to the head of the bone.—*Author.*	As in the Gorilla.—*Author.*
		The lesser trochanter is more prominent and stronger than in Man. *Owen.*	The lesser trochanter is relatively much larger than in Man.—*Author.*
TIBIA.	Is 2 inches longer than the humerus. *Author.*	Is barely $\frac{2}{3}$ the length of the humerus. *Owen.*	Is more than 1-12th of its own length longer than the humerus.—*Author.*
FIBULA.	The expanded lower end is vertical, and descends further than the inner malleolus.—*Owen.*	The expanded lower end inclines outward, and does not descend to the head of the inner malleolus. *Owen.*	As in the Gorilla.—*Author.*
FOOT (LENGTH OF).	The tibia of Man being ... 16 inches The foot is ... ... 10 ,,	The tibia being ... $12\frac{1}{2}$ inches The foot is ... ... 12 ,,	The tibia being ... ... $4\frac{3}{4}$ The foot is ... ... $4\frac{1}{2}$
Relative lengths of Digits. The letters express the order of precedence as regards length.	1st, or great toe ... *b.* 2nd ... ... *a.* 3rd ... ... *c.* 4th ... ... *d.* 5th ... ... *e.* *Author.*	1st, or hind thumb *e.* 2nd ... ... *c.* 3rd ... ... *a.* 4th ... ... *b.* 5th ... ... *d.* *Owen.*	1st, or thumb ... *e.* 2nd ... ... *c.* 3rd ... ... *a.* 4th ... ... *b.* 5th ... ... *d.* *Author*
1ST DIGIT.	Cannot be opposed to the others. *Owen.*	Can be opposed to the others.—*Owen.*	As in the Gorilla.—*Author.*

* Dr. Humphry (loc. cit.) remarks, "In the Monkey the upper end of the radius has lost its circular form, and extends into the space between the condyles o the humerus; and the cuneiform bone is articulated with the lower end of the ulna." In Macaque the head of the radius is as circular as in Man, and mos certainly does not rise into the space between the condyles of the humerus, but is articulated as in him. The neck and shaft of the bone are, it is true, mor angular than in Man. Again, although the styloid process of the ulna articulates with a portion of the cuneiform bone, still the greater part of the latter i separated from the *lower end* of the ulna by a triangular fibro-cartilage as in Man.—*Author.* Speaking of the wrist joint in the Gorilla, Prof. Duvernoy observes:— "L'apophyse styloïde du cubitus s'articule immédiatement avec le pyramidal par un fibro-cartilage. Ainsi, l'articulation du cubitus, qui contribue à celle du poignet. se fait par un cartilage intermediaire, qui forme la partie interne de la capsule radio-articulaire. Ce cartilage intra-articulaire répond au cartilag triangulaire chez l'homme. La partie interne de cette articulation se compose de la facette articulaire du radius, et de la partie interne, du cartilage triangulair que nous venous d'indiquer et qui répond à la facette articulaire du cubitus."

MUSCLES OF THE THORACIC EXTREMITY.

	IN MAN.	IN GORILLA.	IN MACAQUE.
PECTORALIS, MAJOR & MINOR.	The pectoralis major consists of a sterno-clavio-humeral portion alone. *Author.*	The pectoralis major is composed of two distinct muscles, one of which might be called sterno-clavio-humeral, arising and being inserted as in Man. The other sterno-humeral, arising and being inserted as its name implies.—*Duvernoy.*	The pectoralis major has origins and insertion as in Man.—*Author.*
	The pectoralis minor is single. It arises from the second, third, and fourth ribs, and is inserted into the coracoid process of the scapula. *Author.*	The pectoralis minor likewise consists of two portions, and is very large. *Duvernoy.*	A second pectoral muscle which cannot be called " minor " arises from the cartilages of the true ribs, and from the abdominal aponeurosis as low as the cartilage of the tenth rib ; it is inserted into the capsular ligament of the shoulder joint, coraco-acromial ligament, and coracoid process, and downwards as far as the bicipital groove, blending with the other pectoral. *Author.*
SUBCLAVIUS.	Passes from the first rib to the under surface of the clavicle.—*Author.*	No mention is made of this muscle. *Author.*	Is relatively much larger than in Man.—*Author.*
TERES MAJOR.	Is relatively much smaller than in Gorilla and Macaque.—*Author.*	Is a very powerful muscle. *Duvernoy.*	As in the Gorilla.—*Author.*
DORSO-EPITROCHLEARIS.	No such muscle exists.	This singular muscle is attached above to the tendon of the latissimus dorsi, near its insertion into the humerus. It passes down the inner and posterior surface of the arm, to be inserted into the inner condyle of the humerus. *Duvernoy.*	It is attached above to the tendon of the latissimus dorsi as the latter approaches the humerus, and descends to be inserted by an aponeurosis into the internal condyle and olecranon.—*Author.*
FLEXOR PROFUNDUS DIGITORUM.	Is inserted into the last phalanges of the second, third, fourth, and fifth fingers.—*Author.*	Is inserted into the last phalanges of the third, fourth, and fifth fingers. *Duvernoy.*	In two specimens as in Man. In a third, this and the following muscle were inseparable.—*Author.*
FLEXOR LONGUS POLLICIS.	Is inserted into the last phalanx of the thumb.—*Author.*	Arises from the radius in common with a flexor of the second finger, than the tendon of which its own is smaller.—*Duvernoy.*	In two specimens as in Man. In a third it was conjoined with the muscle above. In all its tendon was the weakest of those inserted into the last phalanges.—*Author.*

MUSCLES OF THE PELVIC EXTREMITY.

	IN MAN.	IN GORILLA.	IN MACAQUE.
Gracilis.	Is inserted immediately beneath the tendon of the sartorious.—*Author.*	Is a strong muscle; its tendon is inserted much below that of the sartorius into the anterior aspect of the inner surface of the tibia. *Duvernoy.*	As in the Gorilla.—*Author.*
Adductors of the Thigh. It will be seen that these muscles differ much in the Gorilla and Macaque from those in Man. As the account given of them by Professor Duvernoy is very puzzling, I reproduce it here in the original language. The reader must bear in mind that the horizontal and descending rami of the pubes are relatively much longer in Gorilla and Macaque than in Man, and that the tubera ischii are more everted.	Pectineus. Adductor longus. Adductor brevis. Adductor magnus. The Pectineus passes from the horizontal ramus of the pubes to the femur below the lesser trochanter. The adductor longus from the body of the pubes to the middle third of the linea aspera. These two muscles are inserted on the same plane. The adductor brevis arises from the descending ramus of the pubes and is inserted higher than and behind the adductor longus. The adductor magnus arises from the tuberosity and ramus of the ischium and from part of the descending ramus of the pubes, and is inserted nearly into the whole length of the femur, touching the quadratus femosis above and the internal condyle below.—*Author.*	" Le pectiné (pubo-femorien): c'est un muscle compliqué ; sa portion externe s'attache à la branche horizontale du pubis, et se porte au femur, où elle se termine au-dessous du petit trochanter. Elle est courte et plate à son extremité inferieure ; assez epaisse supérieurement. Plus en dedans et dans tout le reste de l'etendue de la branche horizontale du pubis, jusquà la symphyse, se fixe la seconde portion du pectiné qui est tres épaisse. Son insertion d'autre part, est au dessous du petit trochanter. " Les trois adducteurs de la cuisse (sous-pubo, sous-pubi, et ischii-femoriens). " Il y en a un très fort qui vient de la symphise du pubis. Un autre, qui descend de la branche horizontale du pubis, en dehors de la deuxiene portion du pectiné. " Deux autres très-puissants descendent de la branche descendante de l'ischion. " Les trois premiers se fixent ensemble a une assez grande etendue de la portion inferieure de la ligne âpre du femur. Le dernier descend jusqú au condyle interne. " Tous ces muscles sont remarquables par leur developpement et consequemment par leur puissance d'action.—*Duvernoy.*	As in the Gorilla, but the second portion is without doubt the homologue of the adductor longus in Man.—*Author.* The adductor brevis arises below the longus, or second portion of pectineus, from the descending ramus of the pubes. It is inserted into the femur below the lesser trochanter, behind the first part of the pectineus.—*Author.* Two more adductors are to be described. One very large, arising from the whole length of the symphysis pubis and ascending ramus of the ischium, and from the surface of the bone, between the tuberosity and thyroid foramen. It passes to be inserted into the whole length of the back of the femur as far outwards as to the origin of the vastus externus, and as low down as the external condyle. Another broad muscle arises from the ramus of, the ischium in front of the semi-membranosus. It is inserted into the inner condyle of the femur and ridge above it. *Author.*
Ecto-Gluteus.	Is the gluteus maximus.—*Author.*	Arises from the fascia covering the meso-gluteus which is attached to the crest of the ilium and continuous with the lumbo-sacral aponeurosis ; it is inserted into the whole length of the thigh bone from the great trochanter to the capular ligament of the knee joint.—*Duvernoy.*	As in Gorilla.—*Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
MESO-GLUTEUS.	Is the gluteus medius.—*Author.*	Is larger than the ecto-gluteus, arises from the whole of the external iliac fossa and the crest of the ilium—inserted into the great trochanter. This muscle is relatively much larger than in Man.—*Duvernoy.*	As in Gorilla.—*Author.*
ISCHIO-FEMORALIS.	No such muscle exists in Man. *Author.*	Arises with the long head of the biceps from the ischium, and descends as far as the side of the knee joint, which it covers with an aponeurosis.—*Duvernoy.*	Seems an additional portion of the biceps, which passes down from its free border to be inserted in the fascia of the leg below the knee joint.—*Author.*
BICEPS.	Is inserted into the head of the fibula. *Author.*	Is inserted into the head of the fibula and external tubcrosity of the tibia. *Duvernoy.*	Is inserted into the external tuberosity of the tibia.—*Author.*
PLANTARIS.	Arises from above the external condyle of the femur and unites with the tendo Achillis.—*Author.*	Does not exist.—*Duvernoy.*	Does not exist.—*Author.*
SOLEUS.	Arises from both tibia and fibula. *Author.*	Arises only from the head of the fibula —*Duvernoy.*	As in the Gorilla.—*Author.*
EXTENSOR OSSIS METATARSI POLLICIS VEL ABDUCTOR LONGUS POLLICIS.	No such muscle exists in man. To him it would be useless.—*Author.*	Arises from the outer surface of the tibia and interosseous membrane, between the tibialis anticus and common extensor of the toes, and is inserted into the base of the metatarsal bone of the hind thumb. *Duvernoy.* Without this muscle the hind thumb would be useless.—*Author.*	Arises from the outer side of the head of the tibia, from intermuscular septa and from the fascia of the leg. The tendon descends close to that of the tibialis anticus, from which however it is quite distinct, and is inserted into the base of the metatarsal bone of the hind thumb. Without this muscle the hind thumb would be useless. —*Author.*
PERONEUS TERTIUS.	Arises from lower part of the fibula, and is inserted into the base of the fifth metatarsal bone. Is sometimes absent.—*Author.*	Does not appear to exist.—*Author.*	Does not exist.—*Author.*
PERONEUS LONGUS, (THE ACTION OF).	1stly. To turn the sole of the foot outwards, and 2ndly. To assist in keeping the body in equilibrium, as when standing on one foot.—*Author.*	1stly. Is to be a powerful flexor of the hind thumb, and 2ndly. By making the thumb the fixed point whence to act, to keep the animal's body in equilibrium when swaying from the perpendicular, as in passing from branch to branch. *Author.*	As in Gorilla.—*Author.*
FLEXOR LONGUS POLLICIS.	Is connected by a tendinous slip with the tendon of the long flexor of the toes, as the latter receives the fleshy fibres of the accessorius.—*Author.*	Is so intimately blended with the tendon of the long flexor of the toes as to act simultaneously upon the thumb and three inner fingers at least.—*Duvernoy.*	As in Gorilla.—*Author.*
FLEXOR BREVIS DIGITORUM.	Is inserted into the four outer toes. *Author.*	Is inserted into the second and middle fingers.—*Duvernoy.*	Is inserted only into the second finger.—*Author.*
CONTRAHENTES DIGITORUM.	Do not exist.—*Author.*	Not mentioned as being present. *Author.*	Four small muscles arise together from the fascia and sheath of the peroneus longus and are inserted as follows :—The first into the base of the first phalanx of the thumb ; the second, third, and fourth, into the bases of the first phalanges of the second, fourth, and fifth fingers. The insertion of each is on that side of the phalanx nearest the centre of the foot. The action of these muscles is to draw the thumb and fingers to a point in an imaginary line running longitudinally through the centre of the foot. It is obvious that simple flexion of the middle finger will bring *it* to that point, consequently no such muscle is inserted into *it.* —*Author.*

	IN MAN.	IN GORILLA.	IN MACAQUE.
ADDUCTOR POLLICIS.	Arises from the bases of the second and third metatarsal bones, and is inserted conjointly with the external head of the flexor brevis pollicis into the base of the first phalanx of the great toe.—*Author.*	Arises from the lower extremities of the second, third, and fourth metatarsals, and by an aponeurosis from the whole length of the posterior aspect of the second metatarsal. It is inserted into the outer head of the flexor brevis pollicis.—*Duvernoy.*	Arises from the plantar aspect of the second, third, and fourth metatarsal bones, for the lower half of their extent. The tendon joins that of the outer head of the flexor brevis pollicis.—*Author.*
FLEXOR BREVIS POLLICIS.	Arises from the cuboid bone and tendinous expansion of the insertion of the tibialis posticus; it is inserted by two parts, one into the outer, another into the inner, border of the base of the first phalanx of the great toe, joining, on the one side, the adductor, and on the other, the abductor, pollicis.—*Author.*	Arises by two heads, one of which, (described as the oblique adductor,) arises from the bases of the second and third metatarsal bones; the other from the scaphoid and internal cuneiform bones. These two heads are separated by the tendon of the flexor longus pollicis, and pass to be inserted into the inner and outer sides of the base of first phalanx of the thumb, a sesamoid bone being developed in the tendon of each.—*Duvernoy.*	As in the Gorilla.—*Author.*
OPPONENS VEL FLEXOR OSSIS METATARSI POLLICIS.	Does not exist, but a similar muscle is found in the hand.—*Author.*	A muscular fasciculus is inserted into the whole length of the metatarsal bone of the thumb.—*Duvernoy.*	Arises from the internal cuneiform bone, and is inserted into the whole length of the metatarsal bone of the thumb.—*Author.*
OPPONENS VEL FLEXOR OSSIS METATARSI MINIMI DIGITI.	Does not exist, but a similar muscle is found in the hand.—*Author.*	A muscular fasciculus, intimately connected with the tendon of the abductor minimi digiti, is inserted into the whole length of the metatarsal bone of the little finger. *Duvernoy.*	Arises from the cuboid bone, and is inserted into the whole length of the metatarsal bone of the little finger.—*Author.*
PLANTAR INTEROSSEI.	Adduct the toes to a line running through the centre of the second toe.—*Author.*	Adduct the fingers to a line running through the middle finger. As in the hand.—*Duvernoy.*	As in the Gorilla.—*Author.*
DORSAL INTEROSSEI.	Abduct the toes from a line running through the centre of the second toe.—*Author.*	Abduct the fingers from a line running through the middle finger. As in the hand.—*Duvernoy.*	As in the Gorilla.—*Author.*
TRANSVERSUS PEDIS.	Arises by separate slips from the transverse ligament and from the inferior and lateral aspects of the four outer metatarso-phalangeal articulations. Is inserted with the adductor pollicis into the base of the first phalanx of the great toe. It is sometimes absent.—*Author.*	Does not appear to exist.—*Author.*	Does not exist.—*Author.*

From the foregoing Tables it will be seen that both the great Ape and the little Monkey differ equally from Man.

1st. In the structure of the Head and Face.

2nd. In the most important points of their Dentition.

3rd. In the peculiar disposition and development of their Muscles.

4th. In the remarkable characters of their Hind Limbs.

CONCLUSION.

	MAN.	GORILLA.	MACAQUE.
CLASS.	Mammalia.	Mammalia.	Mammalia.
ORDER, (or distinct standing between all the orders of the same class, characterized by different degrees of complication of structure within the limits of the class.)—*Agassiz.*	Bimana.—*Cuvier.*	Cheiropoda.—*Author.*	Cheiropoda.—*Author.*

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